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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/485,325	05/22/2000	JUERGEN HAHN	10191/1295	1777

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EXAMINER	
STOCK JR, GORDON J	

ART UNIT	PAPER NUMBER
2877	

DATE MAILED: 02/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/485,325	HAHN ET AL.	
	Examiner	Art Unit	
	Gordon J Stock	2877	AW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 November 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 May 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Due to "new matter" issues, a 35 U.S.C. 112 first paragraph rejection has been made to amended claims 9, 10, 12-16 filed on November 6, 2002. Subsequently, the final rejection of January 29, 2003 (paper number 10) has been withdrawn. The following action is in response to the amendment filed on November 6, 2002.

Specification

2. The specification is objected to for the following: the phrase, "analyzer 5.7," of line 11 should read –analyzer 5.4--. Correction is required.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the common carrier and the carrier having a three point support for placement of the film of claim 15; "tangential plane of the substrate" of claim 11 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. **Claims 9, 10, 12-16** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, "a tangential plane that does not intersect the substrate in an area of the incidence point" of **claim 9** is not adequately described in the disclosure: the disclosure explicitly mentions a tangential plane at the incidence point (lines 35-37 of page 5 and lines 1-2 of page 6). With regards to the Figures, Figs. 1 and 2 demonstrate P, incidence point; whereas, there is a tangential plane at the incidence point. Fig. 2 suggests that the tangential plane comprises the line segments comprising the triangle with angles α, β, and δ. No other plane is suggested by the Figures nor the disclosure. **Claims 10, 12-16** are rejected for being depended upon **claim 9**.

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. **Claims 9, 10, 14, and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Finarov (5,764,365)** in evidence of **Finarov (5,333,052)** and in view of **Aspnes (3,985,447).**

As to **claim 9**, Finarov discloses a measurement apparatus comprising:

a light source emitting a beam (Fig. 5c, **120**, **130**, **132**; col. 7, lines 9-67); a transmitting optical system conveying the beam to an incidence point on the substrate (Fig. 5b, **100**, **150**, **154**; col. 7, lines 24-58); a photodetector device (Fig. 5c, **186**,**170**,**172**, **198**); a receiving optical system conveying the reflected beam to the photodetector device (Fig. 5c, **156**, **152**, **102**; col. 7, lines 35-

37; col. 8, lines 46-64); the receiving optical system including an analyzer (Fig. 5c, **160**); an evaluation device, a data processor (col. 11, lines 19-20); an angle measurement device calculating an angle of the reflected beam at the incidence point (Fig. 5c, **152**, **194**, **196**, and **198**; col. 10, lines 65-67; col. 11, lines 1-6); the polarization direction of the beam and of the analyzer being modified in time relative to one another (Fig. 5b, **124** and **140**; Fig. 5c, **160** and **162**).

As for the tangential plane not intersecting the substrate in an area of incidence, Finarov states that the angle is determined from the incidence point being in the focal plane of the objective lens; whereas, the focal plane would be tangent to the incidence point. The angle measurement also is relative to a tangential plane, incident plane, suggested by Figs. 2, 5a, and 5c. This is also in evidence from Finarov in a method and apparatus for automatic optical inspection (Fig. 1).

As for sensing versus calculating an angle, an angle is calculated from a light ray that constitutes an angle comprising the detected ray and a reference ray such as the incident ray or a reference line such as a normal to the surface of the substrate; thereby, if it an angle is calculated it must be sensed in order to perform the calculation.

Finarov is silent concerning the determination of the film thickness as a function of the sensed angle and the intensity changes. However, Finarov implies the film thickness is a function of the sensed angle and intensity changes, for ellipsometric measurements comprise measuring changes in polarization of light by reflectance and ,subsequently, from amplitude and phase changes. And Aspnes in a measurement of thin films states the dependence of amplitude and phase on angles, intensities, and reflectances (col. 4, lines 15-67; col. 5, lines 1-65). Further in evidence Finarov (5,333,052) demonstrates relations of the variables in thickness measurements

(cols. 5-7). Therefore, it would be obvious to one skilled in the art at the time that the invention was made that film thickness would be determined as a function of intensity changes and angles, for Finarov's system measures amplitude and phase changes to determine thickness which are proportional to an angle and intensity.

As to **claim 10**, Finarov discloses everything as above (see **claim 9**), in addition, Finarov discloses the angle measurement device including a photodetector unit that is position-sensitive in at least one of an X and Y direction (col. 11, lines 1-6) with an angle of reflection being calculated from position data and distance data with an evaluation stage (col. 11, lines 7-21).

As to **claim 14**, Finarov discloses everything as above (see **claim 9**). In addition, Finarov discloses a converging lens arranged in front of the photodetector device (Fig. 5c, **168**).

As to **claim 16**, Finarov discloses everything as above (see **claim 9**). In addition, Finarov discloses the transmitting optical system including a polarizer (Fig. 5b, **124**) and a quarter wave plate (Fig. 5b, **122**) in a beam path of the beam. Finarov discloses the polarizer and the analyzer being arranged in rotationally driven fashion about an axis normal to a surface of the one of the polarizer and the analyzer; whereas, Finarov discloses "the polarizer having associated therewith motor drives (Fig. 5b, **140**). Although, not shown, motor drives typically operate with precise angular encoders. (col. 8, lines 25-28)." In addition, Finarov discloses the analyzer being similar to the polarizer (col. 8, lines 55-57) with a motor (Fig. 5c, **162**).

8. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Finarov (5,764,365)** in evidence of **Finarov (5,333,052)** and in view of **Aspnes (3,985,447)** and **Gold et al. (4,999,014)**.

As to **claim 11**, Finarov discloses a measurement apparatus comprising:

a light source emitting a beam (Fig. 3; 30); a transmitting optical system conveying the beam to an incidence point on the substrate (Fig. 3, **32, 34, and 82**; col. 6, lines 20-40); a photodetector device (Fig. 3, **38**) a receiving optical system conveying the reflected beam to the photodetector device (Fig. 3, **36, 76-79**; col. 5, lines 60-67); and the receiving optical system including an analyzer (Fig. 3, **36**). Though Finarov is silent concerning an evaluation device in Figs. 2-3, he teaches an evaluation device, a processor, in another embodiment (col. 11, lines 19-20), therefore, it would be obvious to one skilled in the art to have the ellipsometer comprise an evaluation device in order to process the data gathered. Figure 5b demonstrates that the polarization direction of the beam and of the analyzer would be modified in time relative to one another (Fig. 5b, **124** and **140**; Fig. 5c, **160** and **162**).

As for an angle of reflection being calculated from position data and distance data, the systems of Figs. 2 and 3 assume the reflection angle is equal to the incident angle whereas the surface of the sample is flat. And the incidence angle is determined from the position and distances of the components of the system such as the position of the deflection mirror (col. 5, lines 20-35).

For the embodiments of Figs. 2 and 3, Finarov is silent concerning an angle measurement device. However, he teaches using an angle measurement device in an ellipsometric device that is position-sensitive in at least one of an x and y direction in order to make certain of the correct incidence angle (col. 10, lines 60-65; col. 11, lines 1-10). Therefore, it would be obvious to one skilled in the art to have the embodiment of Fig. 3 comprise an angle measurement device that is position sensitive in at least one direction in order to make certain the incidence angle predetermined is the actual angle produced by measuring it.

As for the tangential plane intersecting the substrate in an area of incidence, the angle measurement is relative to a tangential plane, incident plane, suggested by Figs. 2, 5a, and 5c. This is also in evidence from Finarov in a method and apparatus for automatic optical inspection (Fig. 1).

As for sensing versus calculating an angle, an angle is calculated from a light ray that constitutes an angle comprising the detected ray and a reference ray such as the incident ray or a reference line such as a normal to the surface of the substrate; thereby, if it an angle is calculated it must be sensed in order to perform the calculation.

Finarov is silent concerning the determination of the film thickness as a function of the sensed angle and the intensity changes. However, Finarov implies the film thickness is a function of the sensed angle and intensity changes, for ellipsometric measurements comprise measuring changes in polarization of light by reflectance and ,subsequently, from amplitude and phase changes. And Aspnes in a measurement of thin films states the dependence of amplitude and phase on angles, intensities, and reflectances (col. 4, lines 15-67; col. 5, lines 1-65). Further in evidence Finarov (5,333,052) demonstrates relations of the variables in thickness measurements (cols. 5-7). Therefore, it would be obvious to one skilled in the art at the time that the invention was made that film thickness would be determined as a function of intensity changes and angles, for Finarov's system measures amplitude and phase changes to determine thickness which are proportional to an angle and intensity.

As for the same photodetector sensing intensity changes, see previous paragraph above. In addition, the photodetector 38 of Fig. 3 would sense position data, for a predetermined incident angle is set; thereby, the position data would be sensed, for there is a preset incidence

angle. In addition, Gold in an apparatus for measuring thickness of thin films teaches a detector that measures intensity changes and positional data, the positional data as a function of angle of incidence (col. 6, lines 9-40), and Gold determining changes in reflectivity (Figs. 4a-c) suggest determining intensity changes. It would be obvious to one skilled in the art at the time the invention was made to have the apparatus comprise a photodetector sensing both intensity changes and position data to minimize the cost through the use of fewer photodetectors.

9. **Claims 12-13** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Finarov (5,764,365)** in evidence of **Finarov (5,333,052)** and in view of **Aspnes (3,985,447)** and further in view of **Tokuhashi et al. (5,838,432)**.

As for **claim 12**, Finarov in evidence of Finarov (5,333,052) and in view of Aspnes discloses everything as above (see **claim 9**). Finarov is silent concerning the photodetector unit including two position-sensitive photodetectors whereas the angle is calculated based on differing positions of the beam on the two position-sensitive photodetectors. Tokuhashi in an angle detection apparatus teaches utilizing two one-dimensional PSD whereas the angle is calculated based on the beam positions on the photodetectors and that one dimensional photodetectors are cheaper than two dimensional psd's (col. 14, lines 5-35). Therefore, it would be obvious to one skilled in the art to have the apparatus comprise two one-dimensional psd's wherein the angle is calculated based on the beam positions on the photodetectors rather than one two-dimensional psd, for one dimensional psd's are much cheaper than two-dimensional psd's.

As for **claim 13**, Finarov in evidence of Finarov (5,333,052) and in view of Aspnes and Tokuhashi disclose everything as above (see **claim 12**). In addition, Finarov discloses a beamsplitter arranged in the beam path of the reflected beam in front of the psd (Fig. 5c, **194**).

However, they are silent concerning the arrangement of the beamsplitter with the two one-dimensional psd's. However, it would be obvious to one having ordinary skill in the art to arrange the beamsplitter and the two photodetectors in order for the two photodetectors to receive the partial beam of the reflected beam from the beamsplitter, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse, 86 USPQ 70.*

10. **Claim 15** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Finarov (5,764,365)** in evidence of **Finarov (5,333,052)** and in view of **Aspnes (3,985,447)** and further in view of **Smith (4,957,368).**

As for **claim 15**, Finarov discloses everything as above (see **claim 9**). In addition, he discloses a carrier for the transmitting and receiving systems (Fig. 4). However, this carrier does not hold the analyzer. So Finarov does not disclose the transmitting optical system and the receiving optical system being integrated into a common carrier. It would have been obvious to one having ordinary skill in the art at the time the invention was made to integrate the transmitting optical system and the receiving optical system into a common carrier for convenient portability, since it has been held that making an old device portable or movable without producing any new and unexpected result involves only routine skill in the art. *In re Lindberg, 93 USPQ 23 (CCPA 1952).*

In another embodiment, Finarov discloses a stationary support for holding a sample in the ellipsometer of Figure 2 (col. 5, lines 10-15). It would have been obvious to one skilled in the art at the time the invention was made to have a stationary three-point support for holding a sample in a common carrier of a portable system because the three-point support is a preferred support

for three points define a plane making the sample flat and the support keeps the sample stationary throughout the measurement process.

In addition, Smith in an apparatus for performing ellipsometric measurements on surfaces teaches measurement systems that are portable and compact; whereas, the sample may be placed into the apparatus (col. 2, lines 15-32). Therefore, it would be obvious to integrate the receiving and transmitting systems and the sample support into a common carrier in order to make the system compact and portable.

Response to Arguments

11. As for the arguments of November 6, 2002 concerning the tangential plane in **claims 9, 10, 14-16**, refer to the claim **9** rejection above. Again, as for the tangential plane not intersecting the substrate in an area of incidence, Finarov states that the angle is determined from the incidence point being in the focal plane of the objective lens; whereas, the focal plane would be tangent to the incidence point. The angle measurement also is relative to a tangential plane, incident plane, suggested by Figs. 2, 5a, and 5c. This is also in evidence from Finarov in a method and apparatus for automatic optical inspection (Fig. 1).

Applicant's arguments of November 6, 2002 with respect to **claims 12, 13, and 15** have been considered but are moot in view of the new ground(s) of rejection.

As for the allowable subject matter as set forth in the prior office action, the Examiner apologizes for the inconvenience caused by the grounds of rejection for **claim 11**, but after performing an updated search, the Examiner found grounds of rejection for **claim 11**.

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and

2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: **(703) 872-9306**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431. The examiner can normally be reached on Monday-Friday, 8:00 a.m. - 4:30 p.m.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

gs
January 28, 2004

Sandra V. Smith
Primary Examiner
Art Unit 2877